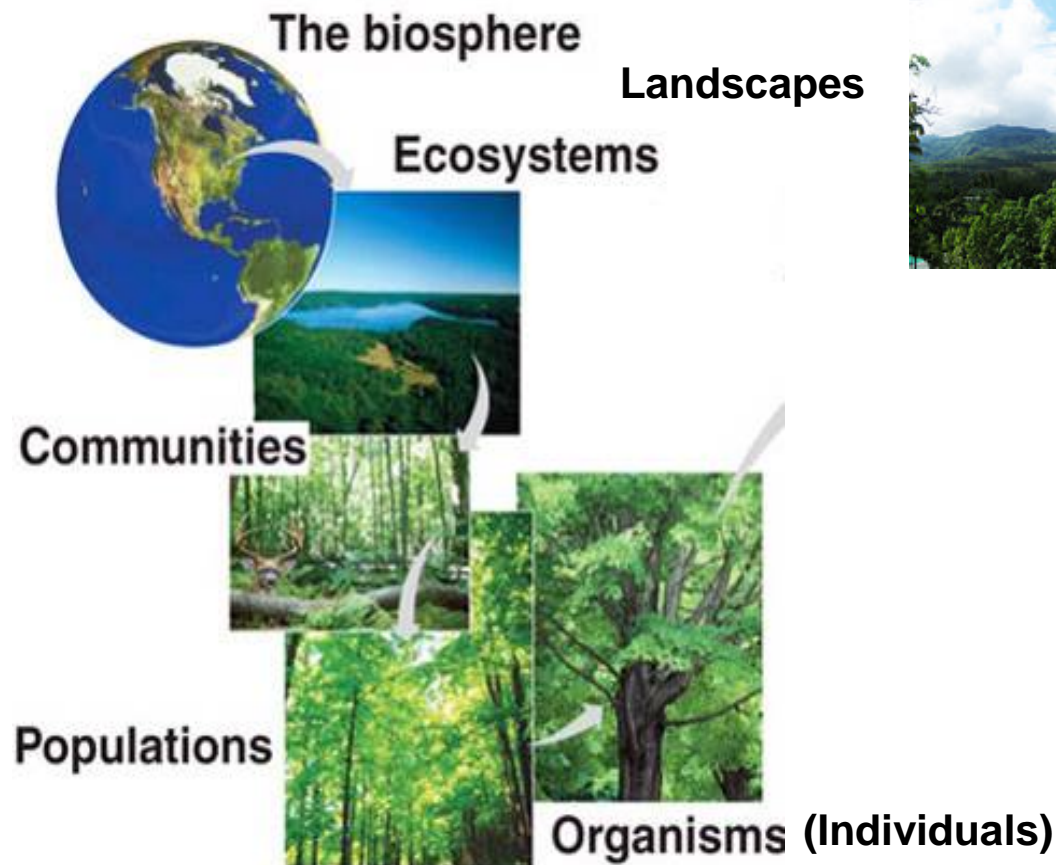


Forest Population Ecology

- Objectives
 - Overview of principles of Population Ecology
 - Importance to ecology & management of forests
 - *“Managers of renewable resources must be mindful of the wide variety of interrelationships between organisms of the same and of different types... Such relationships ... are of key importance in determining the success of forest resource management.”* (Kimmins 2004)
 - **First:** take-home points, things you learned, etc. from reading assignment

Forest Population Ecology

- Ecological Hierarchy



Forest Population Ecology

- Population

- a group of potentially interbreeding & interacting individuals of the same species living in the same place & time

Acacia koa
population



Forest Population Ecology

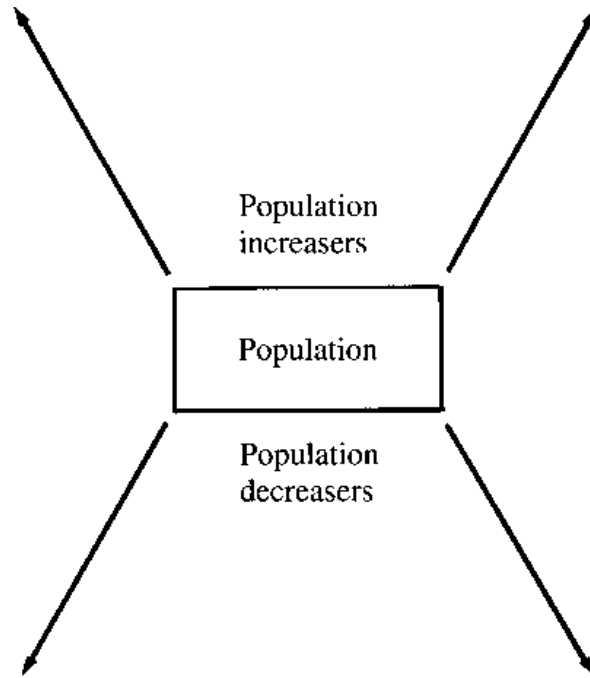
- Populations – Advantages
 - Protection
 - Wind and temperature extremes
 - Reproduction
 - Critical lower population size and density
 - Genetic diversity
 - Aggregation promotes genetic variation
 - Improves probability of survival w/ changing environment
 - Intraspecific competition
 - Natural selection for high fitness

Forest Population Ecology

- Populations – Disadvantages
 - Intraspecific competition
 - Specialized, & competing for same resources
 - Alteration of physical environment
 - Resource limitation
 - Disease transmission
 - Stress
 - Physical proximity
 - Physical interference

Forest Population Ecology

- Population Size



Forest Population Ecology

- Population - Reproduction

Table 14-3 Age at Which Forest Trees Begin to Reproduce Abundantly

	Early, ^a 10–20 yr	Intermediate, 20–40 yr	Late, 40–60 yr
Conifers Pines	Jack, pitch, lodgepole, knobcone, Virginian, sand, Monterey, bishop, slash, loblolly	Red, eastern white, shortleaf	Sugar, western white, ponderosa, limber, whitebark
Other	Tamarack, black spruce, northern white cedar, Port Orford cedar, southern white cedar, cypress	Red and white spruce, balsam fir, Douglas-fir	Spruce, true firs
Hardwoods	Willow, cottonwood, aspen, alder, gray birch, paper birch, pin cherry, red maple, bigleaf maple, box elder, scrub oak, and other fast-growing short-lived trees that produce small seeds	Hickories, maple, basswood, ash, elm, sycamore, chestnut, buckeye	Beech, oak

Forest Population Ecology

- Population - Reproduction

Artificial Regeneration



Natural Regeneration

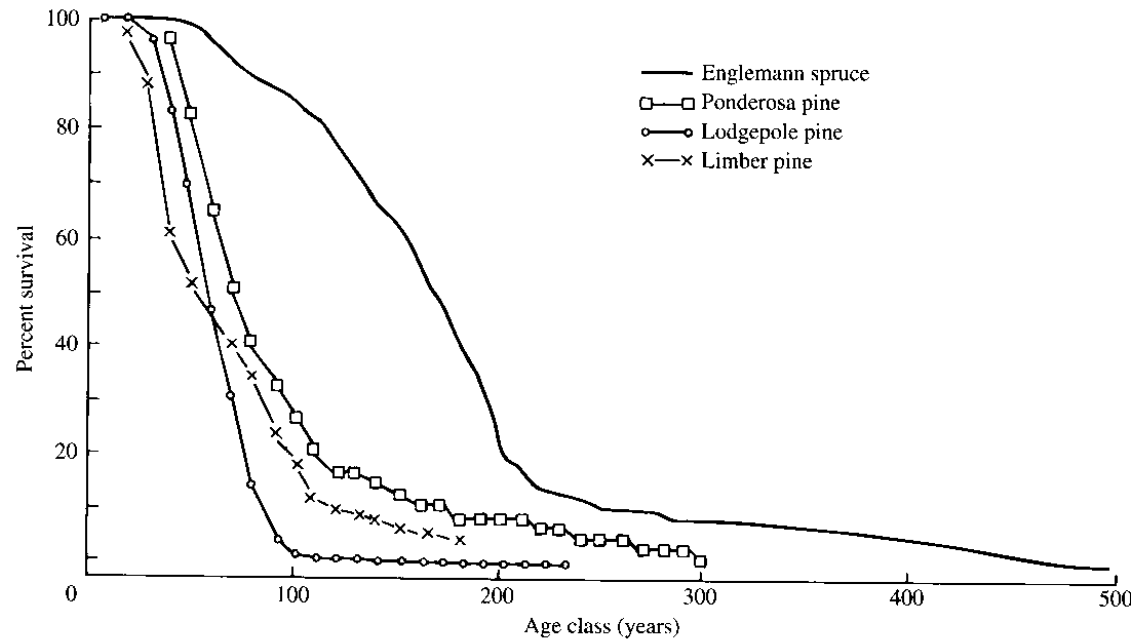
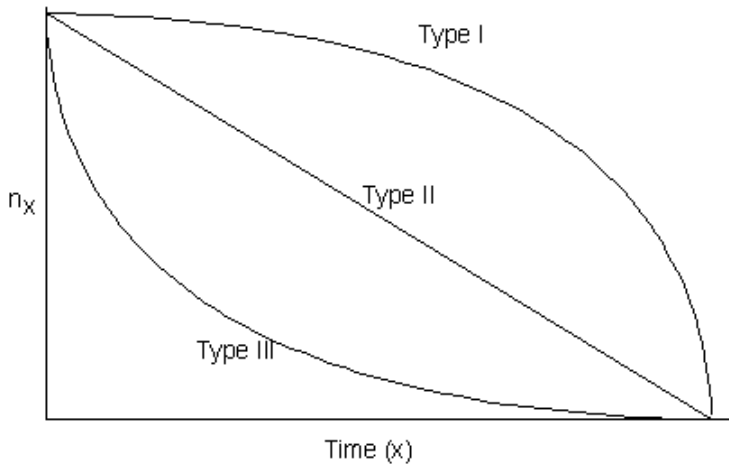


Forest Population Ecology

- Population – Reproduction (Eco. Genetics)
 - Genetic diversity within a population is crucial:
 - Provides the mechanism to respond to environmental variability
 - Base for adaptive evolution
 - Influences interactions with physical environment & other species
 - Largely defines species function within an ecosystem
 - body shape & size, physiological processes, behavioral traits, reproductive charac., environmental tolerance, dispersal & colonization, disease resistance, etc.
 - *To overlook genetic variation is to ignore a fundamental force that shapes the ecology of all living organisms.*” (Falk et al. 2006)

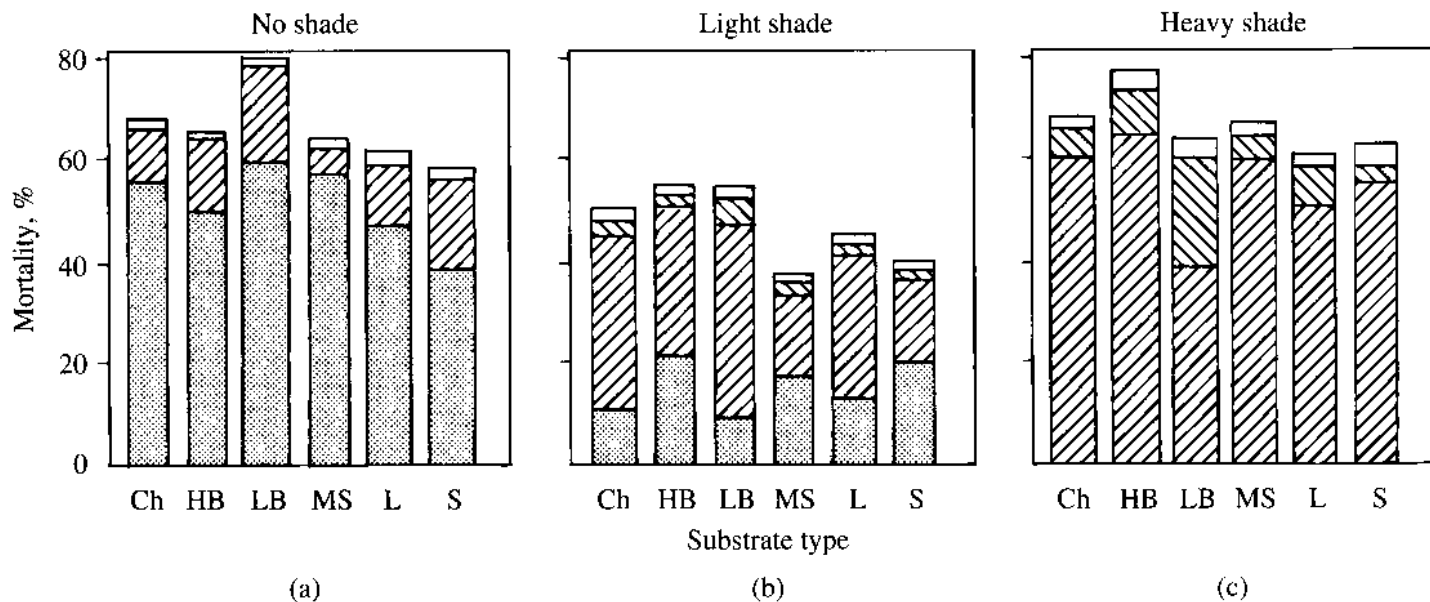
Forest Population Ecology

- Population - Mortality



Forest Population Ecology

- Population - Mortality



Burn type/substrate

Ch = Charcoal MS = Mineral soil

HB = Hard burn L = litter

LB = Light burn S = sawdust

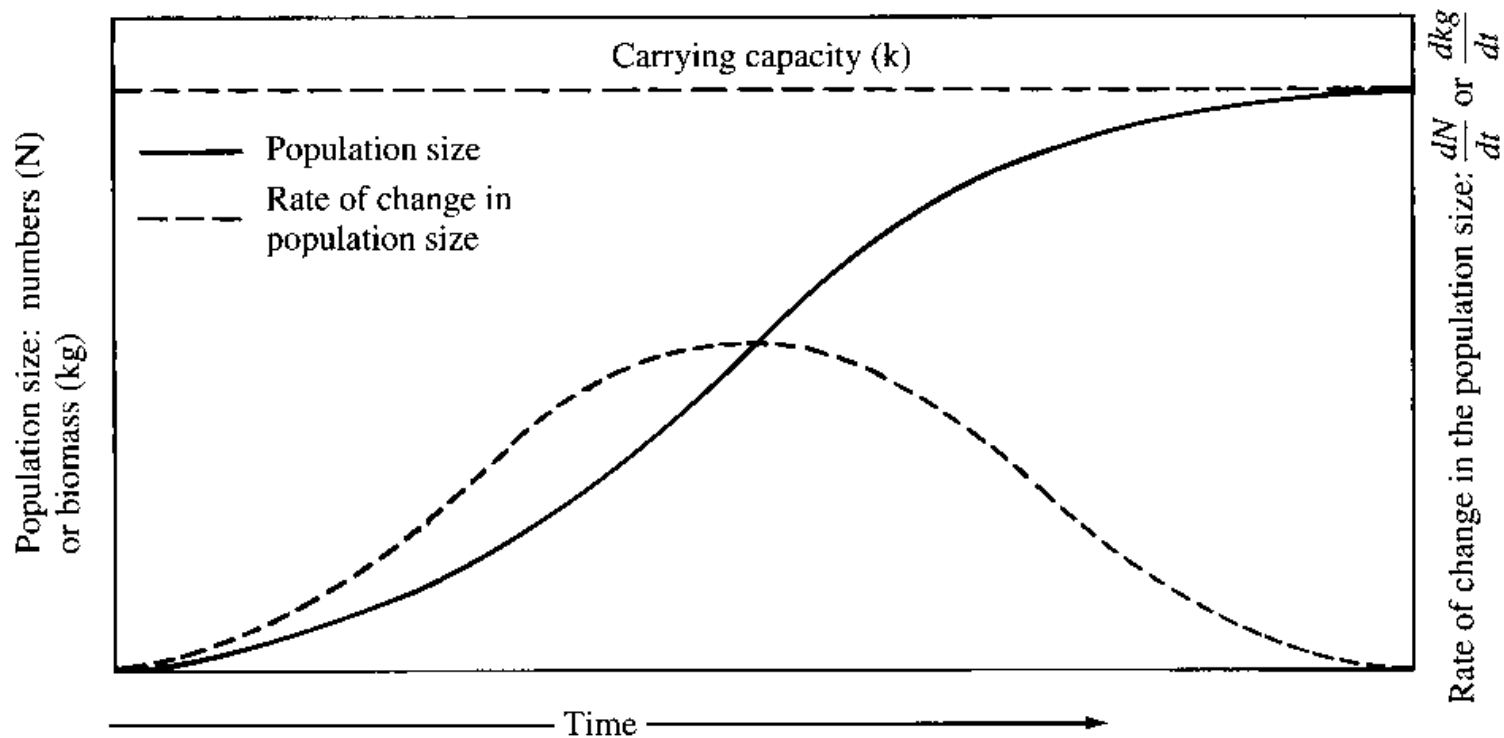
Mortality factor:

Heat Damp-off (fungi)

Animals Other factors

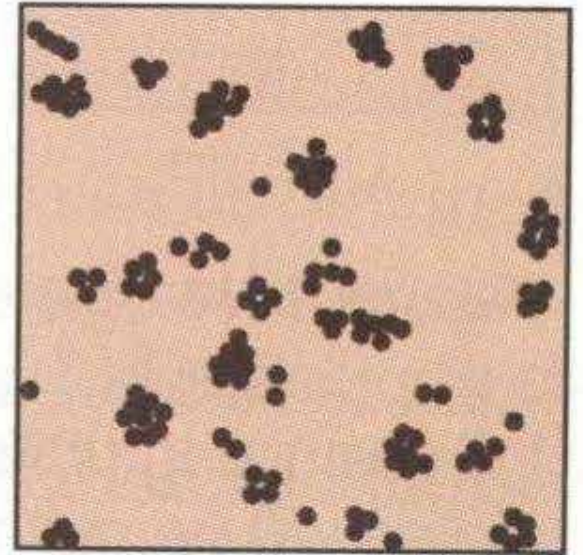
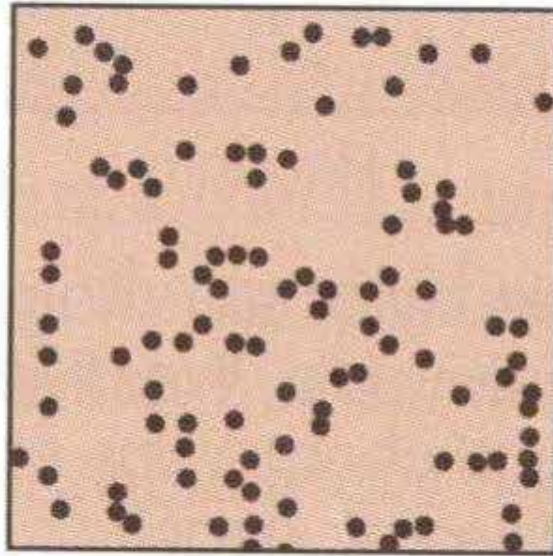
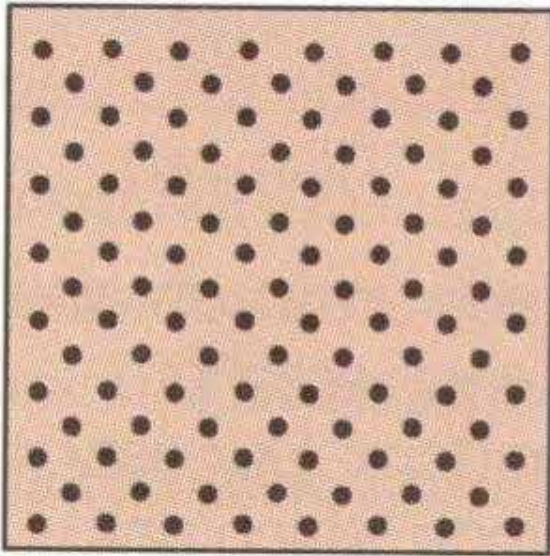
Forest Population Ecology

- Population - Growth Rates



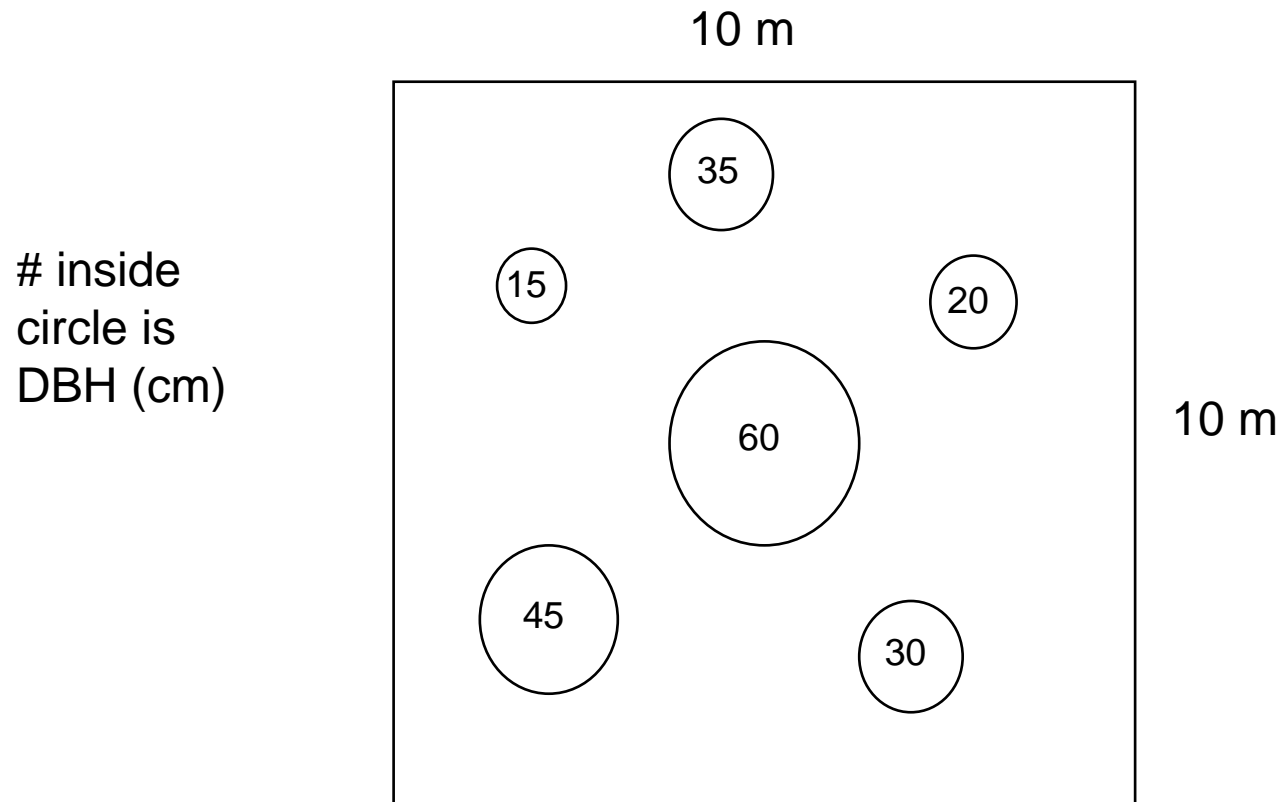
Forest Population Ecology

- Population - Distribution



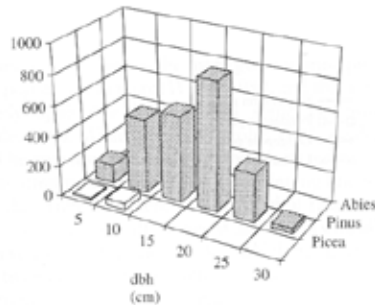
Forest Population Ecology

- Population - Density

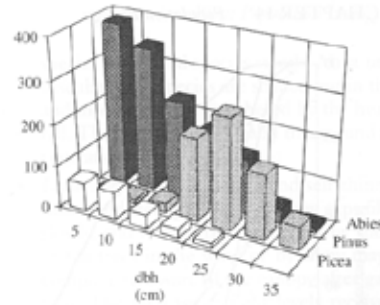


Forest Population Ecology

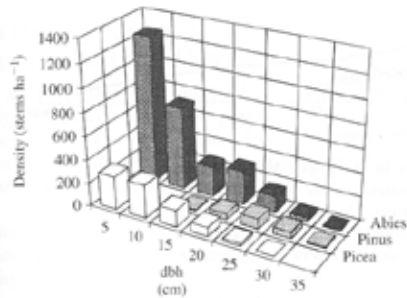
- Population - Age/Size Structure



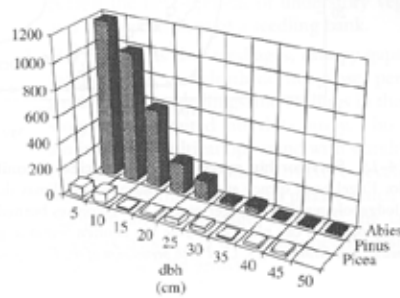
(a)



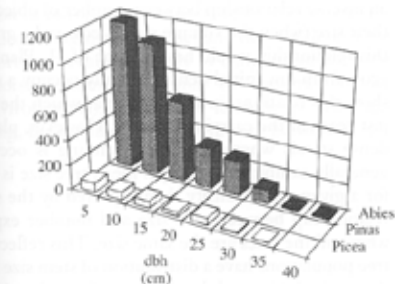
(b)



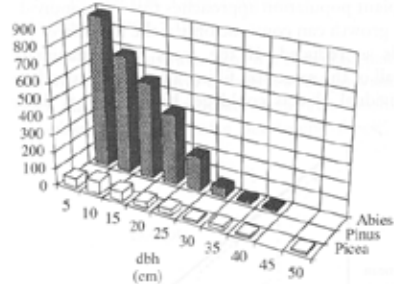
(c)



(d)



(e)

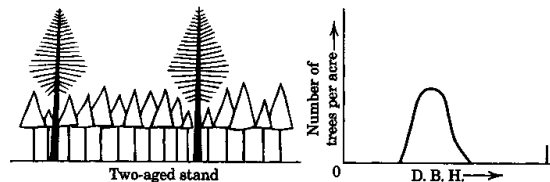
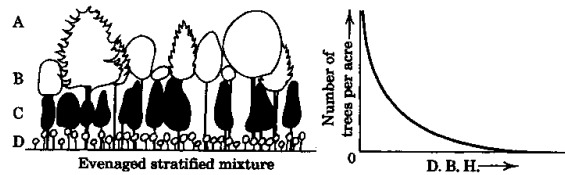
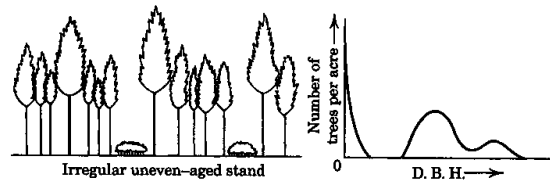
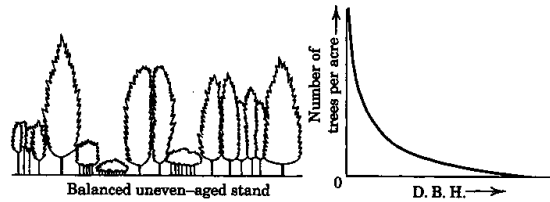
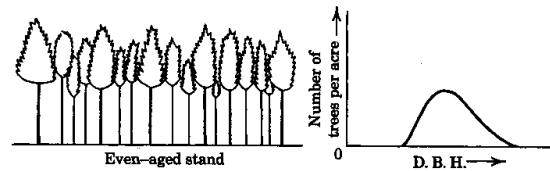


(f)

- a) 68 yrs
- b) 111 yrs
- c) 210 yrs
- d) 311 yrs
- e) 370 yrs
- f) 436 yrs

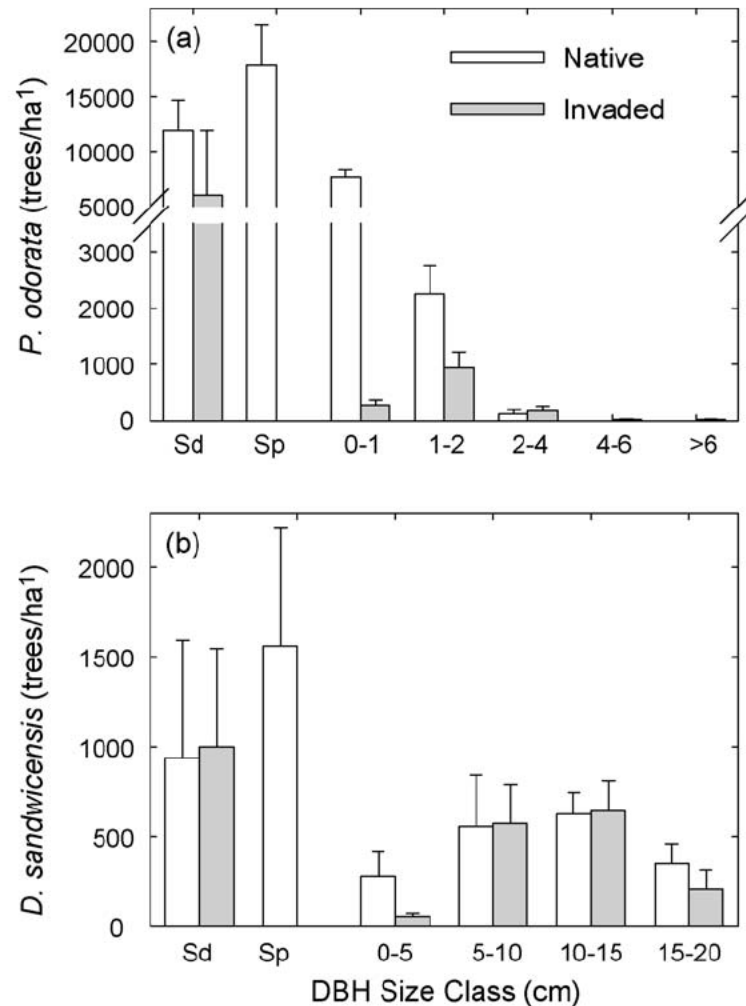
Forest Population Ecology

- Population - Age/Size Structure



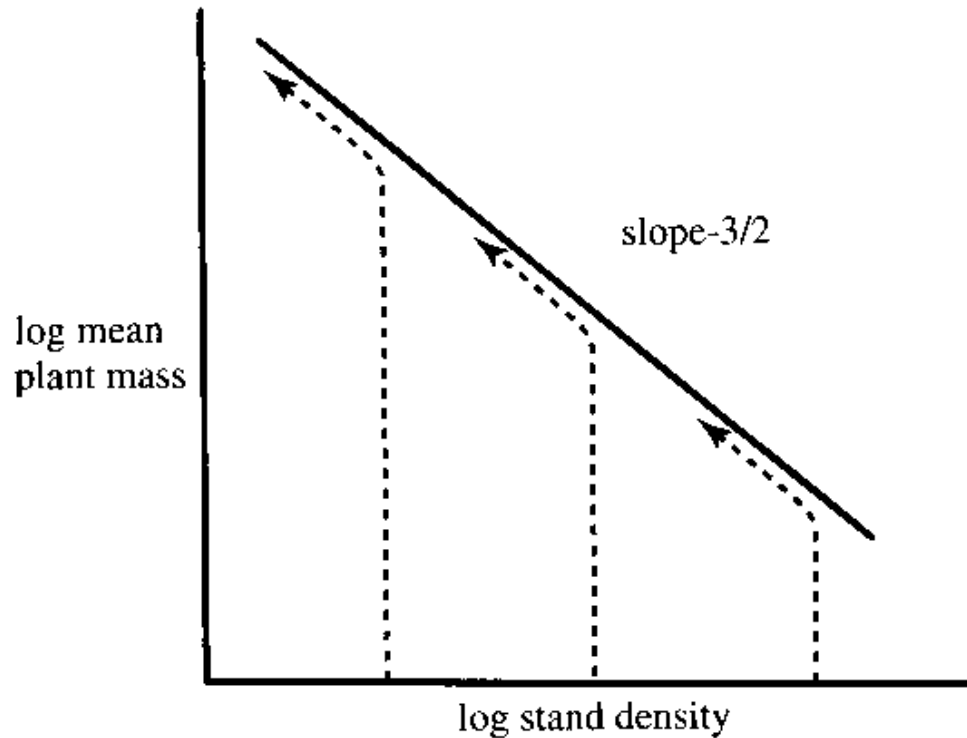
Forest Population Ecology

- Population - Age/Size Structure



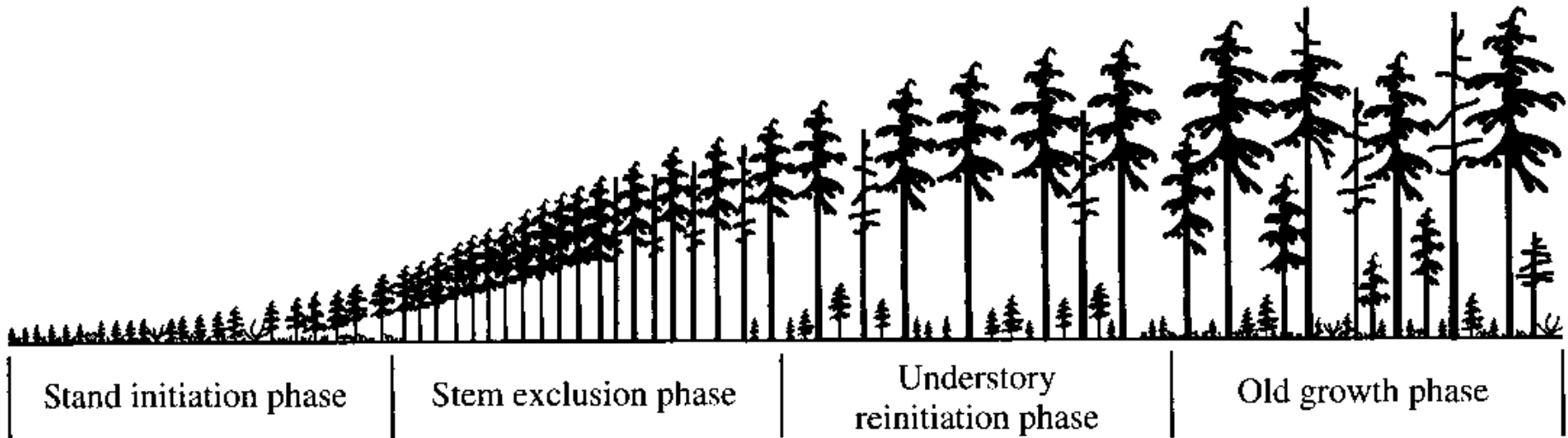
Forest Population Ecology

- Population - Density Regulation



Forest Population Ecology

- Population - Stand Development



Forest Population Ecology

- Population Ecology & Forest Management
 - Forest management \approx Applied population ecology
 - Management of a population of a particular species
 - Objective of obtaining a particular # of individuals of a particular species of a particular size at a particular age
 - Involves management to achieve predetermined distribution for one (or more) species:
 - Reproduction, Survivorship & Mortality
 - Density (Intra- and interspecific competition)
 - Growth rates
 - Size/Age-Class Structure and Distribution
 - Spatial and temporal dynamics and variability

“Clearly, sustainable forest management requires a basic knowledge of population ecology.” (Kimmins 2004)